**Article:**
Nardone, O.M., Calabrese, G., Bertin, L. et al. (5 more authors) (2024) Prevalence of Sexual Dysfunction in Inflammatory Bowel Disease: Systematic Review and Meta-analysis. Journal of Crohn's and Colitis. jjae133. ISSN: 1197-4982

https://doi.org/10.1093/ecco-jcc/jjae133

**Accepted for publication 13th August 2024**

**TITLE PAGE**

**Title:** Prevalence of Sexual Dysfunction In Inflammatory Bowel Disease: Systematic Review and Meta-Analysis.

**Short running title:** Sexual Dysfunction In IBD: Meta-Analysis

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**Abbreviations:**

| | |
|---|---|
| CD | Crohn's disease |
| CI | confidence interval |
| IBD | inflammatory bowel disease |
| OR | odds ratio |
| UC | ulcerative colitis |

## ABSTRACT

**Background & aim:** Patients with inflammatory bowel disease (IBD) may experience symptoms of sexual dysfunction (SD). However, the magnitude of this problem remains uncertain. Therefore, we performed a systematic review and meta-analysis to assess the prevalence of SD in adult patients with IBD.

**Methods:** MEDLINE EMBASE, EMBASE Classic (from inception to 9th April 2024) were searched to identify observational studies reporting the prevalence of SD in adult patients with IBD based on validated screening instruments. Data were extracted, and pooled prevalence (PP), odds ratios (OR), and 95% confidence intervals (CIs) were calculated.

**Results:** Of 1017 citations evaluated, 18 articles fulfilled eligibility criteria, containing 2,694 patients with IBD recruited from 13 different countries. The PP of SD in IBD patients was 50.6% (95% CI=40.8%-60.5%; $I^2$=96.3%) with an OR=2.94 (95% CI=1.99-4.35, $I^2$=73.4) compared to healthy controls. When we considered UC or CD separately, the PP of SD was 64.8% (95% CI=45.1%-82.1%; $I^2$=88.8%) in patients with UC, and 58.3% (95% CI=36.0%-79.0%; $I^2$=95.3%) in patients with CD. In the subgroup analysis based on sex, the PP of SD was higher in females with IBD than in males (62.7% vs 34.0%; OR=3.99, 95% CI=2.80-5.68; $I^2$=61.7%,). Furthermore, the PP of SD was higher in patients with active disease than patients with inactive disease (75.1% vs 34.2%; OR=9.65, 95% CI=1.02-91.33, $I^2$=95.5%).

**Conclusion:** We demonstrated high prevalence of SD in IBD patients, especially in women. Encouraging gastroenterologists to screen for, and treat, these disorders with a holistic approach might improve quality of life of patients with IBD.


**Keywords (max 3):** inflammatory bowel disease; sexual dysfunction; sexuality.

## INTRODUCTION

Inflammatory bowel diseases (IBD), including ulcerative colitis (UC) and Crohn's disease (CD), are chronic, relapsing disorders of the gastrointestinal tract, which can result in debilitating physical and psychosocial symptoms for patients[1-3]. IBD is a substantial global health issue with a high incidence and increasing numbers of prevalent cases worldwide, especially in young individuals[4]. In fact, the peak range of onset for IBD is between 15 and 30 years of age, affecting people in their reproductive years and thereby overlapping with the patient's sexually active period[5]. In addition, the emotional toll of living with a chronic illness and the potential psychological effects of this can further impair sexual health[6].

Sexual dysfunction is a significant health burden characterised by a psychophysiological change in the sexual response cycle[7]. This leads to marked distress and interpersonal difficulties. Notably, sexual dysfunction has recently been incorporated as an objective measure in some disability scoring systems in IBD (e.g., IBD-DISK), underscoring its importance in assessing the overall impact of chronic illnesses on individuals[8]. Multiple factors may be involved in sexual dysfunction in IBD, including disease flares, psychosocial factors, pelvic floor disorders, surgery, and side effects of drugs. Furthermore, extraintestinal symptoms, impaired body image, depression, and fatigue may contribute[9-11].

Sexual dysfunction has three main categories, including impairment in sexual desire, arousal or orgasm, and/or sexual pain[12]. For female patients with IBD, sexual dysfunction mainly manifests as decreased sexual desire, ability to achieve orgasm, and sexual arousal disorder, whereas for men, the most common symptom is erectile dysfunction. Identification of dysfunction in one or more of these categories requires completion of a thorough physical exam, a detailed medical history, and a trusting patient-physician relationship. In addition to these core elements, multiple screening tools are available which may assist in the initial assessment of sexual function, incorporating all these aspects comprehensively [13].

Although numerous studies have reported the prevalence of sexual dysfunction in patients with IBD, these demonstrate varying prevalence rates and as high as 96% in one study[14]. Some of this variation may reflect differences in the tools used to define the presence or absence of sexual dysfunction, but uncertainties remain about the magnitude of this problem, as well as the strength of the association between sexual dysfunction and type of IBD or the impact of biological sex. Previous meta-analyses have addressed the association between IBD and sexual dysfunction in both males and females with IBD[15,16]. However, these have several limitations due to significant variations in sample size, study design, and diagnostic methods for defining sexual dysfunction, as well as the absence of a control group.[15] For instance, in a previous meta-analysis by Chen et al[16], the assessment scales of sexual dysfunction varied across different studies, with some studies not utilizing structured questionnaires. The use of multiple scales across different studies introduces heterogeneity in the measurement, since each scale may have different items, scoring methods, and sensitivity to detect changes in sexual function, leading to variability in the results and making direct comparisons challenging. Furthermore, additional studies have been published since this meta-analysis.

Therefore, we aimed to assess the prevalence of symptoms of sexual dysfunction in adult patients with IBD using validated questionnaires. We also aimed to investigate whether the type of IBD, disease activity, biological sex, or type of questionnaire used to define sexual dysfunction influenced prevalence rates.

## METHODS

### Search Strategy and Selection Criteria

We searched MEDLINE (from inception to 9th April 2024, EMBASE CLASSIC and EMBASE (from inception to 9th April 2024) to identify cross-sectional and case-control studies reporting the prevalence of sexual dysfunction in adult patients (≥18 years) with confirmed IBD. To be eligible, studies had to recruit ≥50 participants[17], to minimise the likelihood of overestimating the magnitude of this issue due to the small sample size and define the presence of sexual dysfunction according to a validated questionnaire[17-21] (Box 1).

We searched the medical literature using the following terms: *ulcerative colitis or colitis, Crohn's disease, inflammatory bowel diseases* (both as a medical subject headings and free text terms). We combined these using the set operator AND with studies identified with the following free text terms: *sexual dysfunction, libido, dyspareunia, erectile, erection, premature ejaculation, early ejaculation, orgasm, desire, arousal* (Supplementary Table 1). There were no language restrictions. We screened titles and abstracts of all citations identified by our search for potential suitability and retrieved those that appeared relevant to examine them in more detail.

To identify potentially eligible studies published only in abstract form, conference proceedings (Digestive Disease Week, American College of Gastroenterology, European Crohn's and Colitis Organization and United European Gastroenterology Week) were also searched. A recursive search of the literature was performed using bibliographies of all relevant studies. We planned to contact authors if a study appeared potentially eligible, but did not report the data required, to obtain supplementary information and, therefore, maximise available studies. If studies did not report data for extraction, and authors were not contactable, we did not consider them eligible for inclusion. Eligibility assessment was performed independently by two investigators (ON and GC), using pre-designed eligibility forms. Any disagreements were resolved by the opinion of a third investigator (BB), and the degree of agreement was measured with a kappa statistic. Ethical approval

was not required. The systematic review was prospectively registered (PROSPERO ID CRD42024563117) and complies with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[22] statement (Supplementary Table 2).

## Data Analysis

Data were extracted independently by two investigators (BB and GC) on to a Microsoft Excel spreadsheet (XP professional edition; Microsoft, Redmond, WA, USA), with any discrepancies resolved by consensus. The following data were collected for each study: country, method of data collection, type of questionnaire for females and males, cut-off used to define the presence of sexual dysfunction, number of patients providing complete data, number of female or male patients, type of IBD [UC, CD, or IBD-unclassified (IBD-U)], number of patients with active or inactive IBD, number of patients with symptoms of sexual dysfunction, number of female or male patients with symptoms of sexual dysfunction, number of patients with active or inactive IBD with symptoms of sexual dysfunction, number of healthy controls (if recruited), and number of healthy controls with symptoms of sexual dysfunction. Currently, there is no universally accepted assessment tool for cross-sectional surveys. Therefore, we used the Newcastle-Ottawa scale, with a total possible score of 9 (higher scores indicating higher quality studies), specifically for evaluating the quality of case-control studies only.

We combined the proportion of individuals with symptoms of sexual dysfunction in each study to give a pooled prevalence for all studies. We assessed heterogeneity between studies using the $I^2$ statistic. The $I^2$ measure ranges between 0% and 100%. Values of 25% to 49%, 50% to 74%, and ≥75% are typically considered low, moderate, and high levels of heterogeneity, respectively[23].

We conducted subgroup analyses according to the different types of IBD (UC, CD, or IBD-U) and the questionnaire used to define the presence of symptoms of sexual dysfunction. Finally, we

compared the prevalence of sexual dysfunction according to type of IBD (UC, CD, or IBD-U), disease activity, female or male sex, and type of questionnaire using an odds ratio (OR) with a 95% confidence interval (CI). We used StatsDirect version 3.2.7 (StatsDirect Ltd, Sale, Cheshire, England) to generate Forest plots of pooled prevalences and pooled ORs with 95% CIs. We planned to assess for evidence of publication bias by applying Egger's test to funnel plots of ORs[24], where sufficient (≥10) studies were available[25].

## Role of the Funding Source

No funding was received. All authors had full access to the data and accepted responsibility to submit for publication.

## RESULTS

The search strategy generated 1097 citations. From these, we identified 104 separate articles that appeared to be relevant to the study question. In total, 18 of these fulfilled eligibility criteria (Figure 1), containing 2,694 patients with IBD recruited from 13 different countries [9-11,14,26-39]. All studies were conducted in a single country.

Among the 18 included studies, five and four studies reported the prevalence of sexual dysfunction separately in patients with CD[11,32,33,35,39] and UC[11,33,35,39], respectively. None of the included studies reported the prevalence of sexual dysfunction for patients with IBD-U separately. Moreover, three studies[11,14,37] recruited only female patients with IBD, and three studies[27,33,38] recruited only male patients with IBD. Ten studies reported the prevalence of sexual dysfunction in healthy controls[10,11,28-30,32,35-37,39].

One of the included studies scored eight [39], one of the included studies scored seven [10], four scored six [28-30,37], two scored five [11,36], and two scored four [32,35] on the Newcastle-Ottawa scale. Agreement between investigators for assessment of study eligibility was good (kappa statistic = 0.75). Detailed characteristics of all included studies are provided in Table 1.

### Pooled prevalence of sexual dysfunction

The pooled prevalence of sexual dysfunction in patients with IBD, based on 18 studies[9-11,14,26-39], which contained 2,694 patients was 50.6% (95% CI 40.8% to 60.5%; $I^2$=96.3%, p<0.001), with no evidence of funnel plot asymmetry (Egger test, p=0.10) (Table 2, Supplementary Figure 1). The lowest pooled prevalence of sexual dysfunction reported in patients with IBD was 28.8% in one Moroccan study[38] (recruiting 52 patients), and the highest was 77.5% in three studies[14,27,33] conducted in the USA (354 patients) (Figure 2).

When we considered UC or CD separately, the pooled prevalence of sexual dysfunction was 64.8% (95% CI 45.1% to 82.1%; $I^2$ = 88.8%, p<0.001) in four studies containing 226 patients with UC [11,33,35,39], and 58.3% (95% CI 36.0% to 79.0%; $I^2$ = 95.3%, p<0.001) in five studies recruiting 410 patients with CD [11,32,33,35,39] (Table 2, Supplementary Figures 2 and 3). The OR for sexual dysfunction in patients with UC versus patients with CD, in four studies that reported prevalence in both UC and CD within the same study population, [11,33,35,39] was 0.92 (95% CI 0.62 to 1.37, with no heterogeneity between studies ($I^2$ = 0%, p=0.70). The pooled prevalence of sexual dysfunction in healthy controls, based on 10 studies including 997 subjects [10,11,28-30,32,35-37,39], was 24.7% (95% CI 16.7% to 33.6%, $I^2$=89.6%, p<0.001). The OR for sexual dysfunction in patients with IBD versus healthy controls in these 10 studies was 2.94 (95% CI 1.99 to 4.35) with high heterogeneity between studies ($I^2$ = 73.4%, p<0.001).

**Prevalence of Sexual Dysfunction According to Disease Activity**

The pooled prevalence of sexual dysfunction was higher in patients with IBD with active disease in three studies [11,33,36] (75.1%, 95% CI 45.5% to 55.1%, $I^2$ = 93.7%, p<0.001) compared with those with inactive disease in four studies[11,26,33,36] (34.2%, 95% CI 16.0% to 95.4%, $I^2$ = 95.5%, p<0.001) (Table 2). The OR for sexual dysfunction in active versus inactive disease in three studies that reported prevalence in both active and inactive disease within the same study population [11,33,36], was 9.65 (95% CI 1.02 to 91.33), with high levels of heterogeneity between studies ($I^2$ = 95.5%, p<0.001).

**Prevalence of Sexual Dysfunction According to Biological Sex**

When we conducted subgroup analyses based on biological sex, the pooled prevalence of sexual dysfunction was higher in women with IBD (62.7%; 95% CI 51.0% to 73.7%, $I^2$=93.9%,

p<0.001) in 12 studies[9,10,14,26,28-30,32,34-36,39], compared with men (34.0%; 95% CI 21.1% to 48.2%, $I^2$=96.3%, p<0.001) in 14 studies[9,10,26-30,32-36,38,39] (Table 2). The OR for sexual dysfunction in women with IBD versus men in 12 studies was 3.99 (95% CI 2.80 to 5.68)[9,10,14,26,28-30,32,34-36,39], with moderate heterogeneity ($I^2$ = 61.7%, p=0.002).

When the same analyses were conducted on studies reporting the prevalence of sexual dysfunction in patients with CD, the pooled prevalence of sexual dysfunction was higher in women with CD (71.7%; 95% CI 39.6% to 94.7%, $I^2$ = 95.2%, p<0.001)[11,14,32,39], compared with men (52.6%; 95% CI 21.1% to 83.0%, $I^2$ = 96%, p<0.001)[27,32,33,39]. Similarly, the prevalence of sexual dysfunction was higher in women with UC (82.6%; 95% CI 58.9% to 97.3%, $I^2$ = 87.6%, p<0.001)[11,14,39], compared with men (51.1%; 95% CI 23.6% to 78.2%, $I^2$ = 81.8%, p=0.02)[27,39] (Table 2). Based on two studies[32,39], the OR for sexual dysfunction in women with CD versus men was 2.46 (95% CI 1.03 to 5.88, $I^2$ = 29.7%, p=0.23). No studies evaluated the prevalence of UC in men and women with UC separately within the same population.

**Prevalence of Sexual Dysfunction According to the Questionnaire Used**

All the included studies[9-11,14,26,28-32,34,36,37] enrolling females used the Female Sexual Function Index to define sexual dysfunction, except for one[39] study that used the Arizona Sexual Experiences Scale (ASEX), one[35] using the Brief Index of Sexual Functioning for Women, and one[26] that used the Female Sexual Dysfunction Index (Table 1). Excluding these three studies in a sensitivity analysis, we found a prevalence of sexual dysfunction of 61.7% (95% CI 47.3% to 75.1%, $I^2$ = 95.3%, p<0.001). Likewise, all the included studies[9,10,26-36,38] enrolling males used the International Index of Erectile Function questionnaire to define sexual dysfunction, other than one[39] that used the ASEX questionnaire (Table 1). Excluding this study in a sensitivity analysis, we found a prevalence of sexual dysfunction of 32.1% (95% CI 19.0% to 46.9%, $I^2$ = 96.3%, p<0.001).

## DISCUSSION

This systematic review and meta-analysis has assembled data from 18 studies that reported the prevalence of sexual dysfunction in patients with IBD using validated questionnaires. We found a pooled prevalence of sexual dysfunction in patients with IBD of 50.6%. Compared with healthy controls, patients with IBD had nearly three times higher odds of sexual dysfunction, suggesting a significantly higher likelihood of sexual dysfunction among patients with IBD. Considering UC and CD separately, the pooled prevalence of sexual dysfunction was similar in both conditions. Further subgroup analyses based on biological sex revealed that the pooled prevalence of sexual dysfunction was higher in females with IBD compared with males, with four times higher odds of sexual dysfunction. Similar trends were observed when analysing CD and UC patients separately by biological sex, although limited data were available for this subgroup analysis. Finally, the pooled prevalence of sexual dysfunction was higher in patients with IBD with active disease compared with those with inactive disease, with nine-fold higher odds of sexual dysfunction.

Previous meta-analyses examining this issue[15,16,40] employed diverse and potentially non-validated tools for assessing sexual dysfunction, evaluated females and males separately, lacked a control group, and applied less stringent inclusion criteria regarding patient population and sample size. These factors could introduce variability and compromise the reliability of the results. In this meta-analysis, we used a contemporaneous search strategy to maximise the likelihood of identifying pertinent literature. Judging of study eligibility and data extraction were carried out by two investigators independently, with discrepancies resolved by consensus. We used a random effects model to pool data to provide a more conservative estimate of the prevalence of sexual dysfunction and assessed for publication bias, where sufficient studies existed. To minimise the influence of heterogeneity on our results, we performed subgroup analyses based on the type of IBD, disease activity, and biological sex. Furthermore, we only included studies that used a validated instrument

to assess for presence of sexual dysfunction and we assessed the prevalence of sexual dysfunction based on the questionnaire used.

A strength of this study is that we excluded all studies involving patients who underwent surgery to mitigate potential bias stemming from surgical procedures. Indeed, data are quite discordant regarding the association between surgery and sexual dysfunction. Some studies have shown no difference in sexual health after proctocolectomy with J-pouch anastomosis in UC[41], while others[42,43] report that both men and women had improvements in general and IBD-specific quality of life after surgery, and men demonstrated several areas of improved sexual function. A study conducted by Nøhr et al.[44] found that women with CD who underwent surgery had an increased risk of difficulties in achieving orgasm and dyspareunia, compared with women with CD who had not had surgery, although none of these estimates reached statistical significance.

However, limitations of the study should be acknowledged. Specifically, all studies were conducted within a single country, and data on the prevalence of sexual dysfunction from several countries and regions were lacking. This limitation prevents a comprehensive understanding of sexual dysfunction across different regions, particularly in those with lower economic and medical resources. Nevertheless, the pooled prevalences from multiple studies provide a broad overview of the prevalence of sexual dysfunction and enhances the generalizability of our findings.

Indeed, sexual dysfunction can be influenced by race, culture, and ethnicity, which can impact how individuals experience and perceive sexual functioning and dysfunction. Furthermore, individuals' willingness to report symptoms could consequently influence prevalence rates. It is worth noting that the lowest pooled prevalence of sexual dysfunction reported in patients with IBD was 28.8% in one Moroccan study[38], while the highest pooled prevalence was 77.5% in three studies conducted in the USA[14,27,33]. This implies that socio-cultural factors, including attitudes towards sexuality and reporting behaviours, may differ between populations and countries. The wide range of reported prevalence rates of sexual dysfunction in patients with IBD underscores the complex and

multifactorial nature of this condition. Therefore, future research efforts should include data from these regions to obtain a comprehensive understanding and more attention to psychosocial insights worldwide. Additionally, we did not assess the prevalence of sexual dysfunction based on age, because most studies did not report mean individuals' age. It is worth noting that age, net of other factors, consistently could increase the likelihood of most sexual problems due to a progressive reduction of gonadal function independent of IBD, increased susceptibility to dyspareunia and diminished libido[45,46]. However, in the meta-analysis of Zhao et al.[47] younger patients with IBD, specifically males under 50 years old and females under 40 years old, had a significantly higher incidence of sexual dysfunction. These results may be influenced by the fact that the onset of IBD often occurs during adolescence or early adulthood, a critical period of psychosocial development. As a result, patients may experience issues with body image, intimacy, courting, and feelings of unattractiveness. In contrast, elderly patients may have had a longer disease duration with potentially less impact from body image concerns and psychosocial issues.

Previous research has yielded controversial findings regarding the association between sexual dysfunction and IBD disease activity. Active symptoms may lead to reduced sexual interest due to fatigue, concerns about body image and intimacy, and pain. Zhang *et al.*[11] did not observe a significant association between disease activity and sexual dysfunction in female patients, suggesting the persistence of impaired sexual function even during the disease's remission period. However, active perianal disease was an independent risk factor for SD. More recently, Mules *et al.*[9] found no objective measures of disease activity, as determined by endoscopy and biomarkers, to be associated with sexual dysfunction or erectile dysfunction in patients with IBD. Conversely, symptoms of severe depression, anxiety, and stress were correlated. Depression and psychological disorders have a significant impact on sexual QOL. This was confirmed in a cross-sectional study [11] where anxiety and depression were independent risk factors for sexual dysfunction in women and for erectile dysfunction in men.

Therefore, clinicians should consider concurrent psychological symptoms that may contribute to the sexual health of patients with IBD. In the current study, we observed a higher prevalence of sexual dysfunction in patients with active disease compared with those with inactive disease, and the odds of having sexual dysfunction were significantly higher in patients with active disease. However, the heterogeneity between studies could potentially be explained by variations in the use of clinical scales to establish disease activity. The mere presence of symptoms without clinical indexes of disease activity may be inadequate because other conditions such as irritable bowel syndrome (IBS), deterioration of body image, or anxiety or depression, can coexist with IBD, thereby impacting the real and objective association between disease activity and sexual dysfunction in IBD patients. Several studies included in our meta-analysis[10,11,26,29,35-37] assessed psychological symptoms in patients with sexual dysfunction reporting that 14% to 47% of patients with IBD experienced anxiety and depression, that severely compromised their sexuality. However, we did not analyse psychosocial factors, as this was not an *a priori* aim of our study.

Finally, we were unable to assess the relationship between quality of life and sexual dysfunction. Unfortunately, only two studies[33,34] reported extractable data on this aspect, preventing meaningful statistical analyses from being conducted. The quality of sexual life represents a significant component of QOL in IBD, as evidenced by lower QOL scores observed in both UC and CD groups with sexual dysfunction[33,34]. Yet it is often overlooked. There are also no formal recommendations on how to approach and manage sexual dysfunction in patients with IBD.

Recently, the European Crohn's and Colitis Organisation guidelines on sexuality, fertility, pregnancy, and lactation[48] have shed light on this topic, addressing many of the questions raised such as fears of infertility, misperceptions about sexuality and pregnancy, with the ultimate goal of promoting education and knowledge, as well as harmonizing multidisciplinary management.

Overall, our study underscores the significant burden of sexual dysfunction among patients with IBD, with implications for clinical management and the importance of sex-specific considerations in

understanding and addressing this issue. Improved clinician awareness and understanding of the aetiology, risk factors, and impact of sexual dysfunction in patients with IBD may result in improved care, and ultimately better health and wellbeing for this patient population. Disability and quality-of-life assessment tools should be integrated into daily activities to enable tailored interventions for IBD patients according to their evolving needs. In fact, the absence of disability and the normalization of quality of life are now considered therapeutic goals, reflecting the value that gastroenterologists should offer their patients in restoring a "normal life" and promoting psychological well-being[49]. Addressing gastrointestinal inflammation alone cannot be the sole focus of treatment for individuals with IBD. The high prevalence of sexual dysfunction highlights its significance for patients and its substantial impact on QOL. IBD specialists should prioritize enhanced screening, identification of issues, and support for patients in managing their condition by providing psychoeducational information and medical treatments. It is crucial that multidisciplinary teams caring for patients with IBD make concerted efforts in this regard. Psychological interventions could play a crucial role in reducing comorbid conditions such as anxiety and depression[50,51], ultimately leading to improved functioning and QOL. In fact, adopting a holistic approach that integrates mental and physical healthcare within a patient-centric clinical care model, is expected to change our perspective on treating IBD, leading to improvements in both patient well-being and objective disease outcomes.

**ACKNOWLEDGEMENTS:** None.

**Funding:** no funding source

**Data availability statement:** the data underlying this article will be shared on reasonable request to the corresponding author.

**Conflicts of interest:** The authors declare no conflict of interest.

**Author contribution:**

OMN, GC and BB conceived and drafted the study. OMN, GC and BB collected, analysed, and interpreted all data. OMN, GC and BB drafted the manuscript. All authors commented on drafts of the paper. All authors have approved the final draft of the manuscript.

**Disclosures:**

OMN: lecture fees from Ferring, Abbvie, Janssen, Eli Lilly, Pfizer, AlfaSigma ; Advisory Board from Nestle

GC: none to declare

LB: none to declare

ACF: none to declare.

FC: received lecture fees and served in advisory board for AbbVie, Biogen, Galapagos, Janssen, Pfizer, Takeda and Lilly

FZ has served as a speaker for Werfen, Abbvie, EG Stada Group, Fresenius Kabi , Kedrion , Janssen, Pfizer, Takeda, Unifarco , Malesci , Galapagos; FZ has served as a consultant for Galapagos and Takeda

EVS has served as speaker for Abbvie, Abivax, Agave, AGPharma, Alfasigma, CaDiGroup, Celltrion, Dr Falk, EG Stada Group, Fenix Pharma, Galapagos, Johnson&Johnson, JB Pharmaceuticals, Innovamedica/Adacyte, Eli Lilly, Malesci, Mayoly Biohealth, Omega Pharma, Pfizer, Reckitt Benckiser, Sandoz, SILA, Sofar, Takeda, Tillots, Unifarco; has served as consultant for Abbvie, Agave, Alfasigma, Biogen, Bristol-Myers Squibb, Celltrion, Dr. Falk, Eli Lilly, Fenix Pharma, Johnson&Johnson, JB Pharmaceuticals, Merck & Co, Nestlè, Pfizer, Reckitt Benckiser, Regeneron, Sanofi, SILA, Sofar, Takeda, Unifarco; he received research support from Bonollo, Difass, Pfizer, Reckitt Benckiser, SILA, Sofar, Unifarco, Zeta Farmaceutici

BB: has served as speaker for Abbvie, Agave, Alfasigma, AGpharma, Janssen, MSD, Pfizer, Sofar, Takeda, Unifarco. BB has served as consultant for Abbvie and Janssen.

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**Box 1. Eligibility Criteria**

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| Cross-sectional surveys or case-control studies. |
| Adults (>90 % of participants aged ≥18 years) with histologically or radiologically confirmed inflammatory bowel disease (Crohn's disease, ulcerative colitis, inflammatory bowel disease-unclassified). |
| Participants not specially selected (e.g. only those who underwent surgery) |
| *Reported the number (proportion) of patients with sexual dysfunction according to a validated questionnaire[18-21]. |
| Sample size of ≥50 participants[17]. |

*Studies reporting only one aspect of sexual dysfunction (e.g., erectile dysfunction only) were considered ineligible

## Table 1. Characteristics of Included Studies.

| Study | Study design | Country | Questionnaire for female sexual dysfunction | Questionnaire for male sexual dysfunction | Disease Type | Sample Size | Number with Sexual Dysfunction (%) | Female Sex n (%) | Male sex n (%) | Age (y) Median (IQR) Mean±SD | Disease duration (y) Median (IQR) Mean±SD | Active disease n (%) | Biologic therapy n (%) | Control population n (type of population) | Number of controls with Sexual Dysfunction (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ait Errami *et al.*, 2019[38]** | Cross-sectional | Morocco | - | IIEF | IBD | 52 | 15 (28.8) | - | 52 (100) | 29.4 (mean) | - | - | - | - | - |
| **Andriolli *et al.*, 2017[37]** | Case-control | Brazil | FSFI | - | IBD | 56 | 26 (46.4) | 56 (100) | - | 38.9±10.2 | - | - | - | 101 (reporting no GI symptoms) | 34 (33.7) |
| **Bel *et al.*, 2015[36]** | Case-control | Netherlands | FSFI | IIEF | IBD | 287 | 116 (40.4) | 168 (58.5) | 119 (41.5) | F: 42.9±12.9 M: 51.1±12.8 | - | 101 (35.2)[§^] | - | 197 (NS) | 70 (35.5) |
| **Bulut *et al.*, 2019[39]** | Case-control | Turkey | ASEX | ASEX | IBD CD UC | 122 58 64 | 85 (69.7) 38 (65.5) 47 (73.4) | 53 (43.4) | 69 (56.6) | CD: 38±12 UC: 44±12 | - | CD: 41[^] (70.7) UC: 48[°] (75.0) | CD: 43 (74.1) UC: 22 (34.4) | 42 (NS) | 26 (61.9) |
| **Dimitriadis *et al.*, 2018[35]** | Case-control | Greece | BISFW | IIEF | IBD CD UC | 153 101 52 | 65 (42.5) 45 (44.6) 20 (38.5) | 74 (48.4) | 79 (51.6) | 44 (median) | - | - | - | 43 (volunteers) | 5 (11.6) |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Domislovic *et al.*, 2021[34]** | Cross-sectional | Croatia | FSFI | IIEF | IBD | 202 | 82 (40.6) | 80 (39.6) | 122 (60.4) | 37.5 (31-46) | 10.9 (4-16) | 30 (14.9)[#*] | 99 (49.0) | - | - |
| **Gaidos *et al.*, 2020[33]** | Cross-sectional | USA | - | IIEF | IBD<br>CD<br>CD | 169<br>89<br>80 | 143 (84.7)<br>78 (87.6)<br>65 (81.3) | - | 171 (100) | 49.5 (23-82) | - | 88 (52.1)[§^] | 92 (54.4) | - | - |
| **Gutiérrez Casbas *et al.*, 2023[32]** | Case-control | Spain | FSFI | IIEF | CD | 108 | 32 (29.6) | 50 (46.3) | 58 (53.7) | - | | 17 (15.7)[^] | - | 55 (NS) | 4 (7.3) |
| **Kaniewska *et al.*, 2022[31]** | Cross-sectional | Poland | FSFI | IIEF | IBD | 135 | 59 (43.7) | 68 (50.4) | 67 (49.6) | - | - | - | - | - | - |
| **Marin *et al.*, 2013[30]** | Case-control | Spain | FSFI | IIEF | IBD | 355 | 121 (34.1) | 202 (56.9) | 153 (43.1) | F: 42.7±9.4<br>M:46.5±10.2 | - | | 43 (12.1) | 200 (NS) | 29 (14.5) |
| **Mules *et al.*, 2023[9]** | Cross-sectional | New Zealand | FSFI | IIEF | IBD | 159 | 49 (30.8) | 85 (53.5) | 74 (46.5) | F: 48 (39-62)<br>M: 43 (33-54) | F: 10 (4-21)<br>M: 14 (8-23) | 72 (45.3)[§^] | 35 (22.0) | - | - |
| **Nisihara *et al.*, 2020[29]** | Case-control | Brazil | FSFI | IIEF | IBD | 80 | 61 (76.3) | 40 (50.0) | 40 (50.0) | F: 42.7±10.6<br>M: 41.2±11.7 | - | - | 12 (15.0) | 112 (reporting no GI symptoms) | 42 (37.5) |
| **Pires *et al.*, 2022[10]** | Case-control | Portugal | FSFI | IIEF | IBD | 120 | 48 (40.0) | 76 (63.3) | 44 (36.7) | F: 41.9±13.1<br>M: 39.5±12.8 | - | 47 (39.2)[^*] | 58 (48.3) | 60 (healthcare workers) | 8 (13.3) |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Riviere *et al*., 2017**[28] | Case-control | France | FSFI | IIEF | IBD | 358 | 131 (36.6) | 192 (53.6) | 166 (46.4) | 39 (28-47) | 9 (5-15) | 50 (14.0)^* | 279 (77.9) | 109 (reporting no GI symptoms) | 19 (17.4) |
| **Shmidt *et al*., 2019**[27] | Cross-sectional | USA | - | IIEF | IBD | 69 | 27 (39.1) | - | 69 (100) | 43.4±19.2 | - | - | 0 | - | - |
| **Shmidt *et al*., 2019**[14] | Cross-sectional | USA | FSFI | - | IBD | 116 | 112 (96.6) | 116 (100) | - | CD: 37.5±14.7<br>UC: 43.3±16.3 | - | - | 1 (0.9) | - | - |
| **Xanthis *et al*., 2016**[26] | Cross-sectional | Greece | FSDI | IIEF | IBD | 69 | 37 (53.6) | 39 (56.5) | 30 (43.5) | 42.6±1.6 | 10.7±1.02 | - | - | - | - |
| **Zhang *et al.*, 2022**[11] | Case-control | China | FSFI | - | IBD<br>CD<br>CD | 84<br>54<br>30 | 52 (61.9)<br>33 (61.1)<br>19 (63.3) | 84 (100) | - | F: 36 (20-67)<br>M: 36 (20-64) | F: 5 (2-8)<br>M: 4 (2-7) | 44 (52.4)#* | 45 (53.6) | 78 (NS) | 19 (24.4) |

Assessed by *pMAYO; §SCCAI, Simple Clinical Colitis Activity Index; °MCUCAI, Modified Sutherland Ulcerative Colitis Activity Index; ^HBI, Harvey-Bradshaw Index; #CDAI, Crohn's Disease Activity Index; NS, not specified.
Legend: GI: gastrointestinal; NS: not specified;

**Table 2. Pooled prevalence of Sexual Dysfunction in all Patients with IBD, UC and CD and According to Sex.**

| | **Disease Activity** | **Number of Studies** | **Number of Patients** | **Pooled Prevalence (%)** | **95% Confidence Interval** | **$I^2$** | **P Value for $\chi^2$** |
|---|---|---|---|---|---|---|---|
| IBD | Active | 3 | 230 | 75.1 | 45.5 – 55.1 | 93.7 | <0.001 |
| | Inactive | 4 | 379 | 34.2 | 16.0 – 95.4 | 95.5 | <0.001 |
| | **Sex** | **Number of Studies** | **Number of Patients** | **Pooled Prevalence (%)** | **95% Confidence Interval** | **$I^2$** | **P Value for $\chi^2$** |
| IBD | - | 18 | 2694 | 50.6 | 40.8 – 60.5 | 96.3 | <0.001 |
| IBD | Women | 12 | 1177 | 62.7 | 51.0 – 73.7 | 93.9 | <0.001 |
| | Men | 14 | 1244 | 34.0 | 21.1 – 48.2 | 96.3 | <0.001 |
| CD | - | 5 | 410 | 58.3 | 36.0 – 79.0 | 95.3 | <0.001 |
| CD | Women | 4 | 188 | 71.7 | 39.6 – 94.7 | 94.7 | <0.001 |
| | Men | 4 | 222 | 52.6 | 21.1 – 83.0 | 96.0 | <0.001 |
| UC | - | 4 | 226 | 64.8 | 45.1 – 82.1 | 88.8 | <0.001 |
| UC | Women | 3 | 115 | 82.6 | 58.9 – 97.3 | 87.6 | <0.001 |
| | Men | 2 | 63 | 51.1 | 23.6 – 78.2 | 81.8 | <0.001 |

**Figure legend**

**Figure 1.** Flow Diagram of Assessment of Studies Identified in the Meta-analysis.

**Figure 2.** Global Prevalence of Sexual Dysfunction in Patients with Inflammatory Bowel Diseases.